

TWO NEW INDO-PACIFIC MORAYS OF THE GENUS *UROPTERYGIUS* (ANGUILLIFORMES: MURAENIDAE)

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ABSTRACT

Two closely-related new species of Indo-Pacific morays are described herein. *Uropterygius xenodontus*, from the central and western Pacific, and *U. golanii*, from the northern Red Sea, differ from each other in their vertebral numbers, and from all other congeners which possess a single branchial pore on the basis of their coloration, vertebral number, and dentition. The possession by the new species of wedge-shaped rather than conical jaw teeth within species of *Uropterygius* as well as the relationship of vomerine dentition to fish size are discussed.

The nearly finless species of the cosmopolitan moray genus *Uropterygius* Rüppell (1838) all share a distinctive combination of characters. They, and the two species of the closely related genus *Scuticaria* Jordan and Snyder (1901) and the species of *Anarchias* Jordan and Starks (in Jordan and Seale, 1906), are easily distinguished by their possession of numerous conical teeth and the restriction of their median fins to the posterior tail region. We recently each received specimens of a curious species of *Uropterygius* from the Red Sea. The jaw dentition, nearly wedge-shaped rather than conical, was unlike that of any *Uropterygius* with which we were familiar. We found them to be a new species but were stymied by their nearly complete *Uropterygius*-like facies but distinctly different dentition. A more extensive search for additional specimens and an evaluation of the dentition within the genus resulted in the discovery of yet another closely related and undescribed species, as well as a better understanding of the range of dentition within *Uropterygius*. The species of *Uropterygius* have not been analyzed on a world-wide basis, and to that end we are working towards a revision of the genus. At this time, however, such a project is far from complete, and we wish to describe these new species in this Festschrift honoring C. R. Robins, our friend, mentor, and a student of eels.

Several regional studies of moray eels have been published in recent years, and we refer the reader, without analysis and comment, to those works. Red Sea and Indian Ocean morays were treated by J. L. B. Smith (1962), and the morays of southeast Africa were reviewed by Castle and McCosker (1986). The eels of Reunion Island were treated by Quéro and Saldanha (1995) and Randall and Golani (1995) reviewed the Red Sea species. McCosker et al. (1984) reviewed the Japanese species of *Uropterygius* and proposed that the large species *bennettii* and *tigrinus* "form a distinct lineage that is worthy of at least subgeneric rank. The name *Scuticaria* is available and may be found, after a careful examination of all species within the genus *Uropterygius*, to deserve generic status." Chen et al. (1994) reviewed the muraenid eels of Taiwan, and included three species of *Uropterygius*. Böhlke et al. (1989) reviewed the western Atlantic morays and recognized *Scuticaria* Jordan and Snyder (1901) as distinct; we concur. The leptocephalus of *U. macularius* was described and illustrated by D. Smith (1989) and that of *U. wheeleri* (as *U. diopus*) by Blache (1971). The eastern Pacific species were included in

McCosker and Rosenblatt's (1975, 1995) treatment of the Galapagos moray fauna and in the FAO eastern Pacific faunal review.

MATERIALS AND METHODS

Measurements are straight-line, made either with a 300-mm ruler with 0.5-mm gradations (for total length, trunk length, and tail length) and recorded to the nearest 0.5 mm, or with dial calipers (all other measurements) and recorded to the nearest 0.1 mm. Body length comprises head and trunk lengths. Head length is measured from the snout tip to the posterodorsal margin of the gill opening; trunk length is taken from the end of the head to mid-anus; maximum body depth does not include the median fins. Pore terminology follows that of Böhlke et al. (1989). Vertebral counts (which include the hypural) are taken from radiographs. Institutional abbreviations follow the Standard Symbolic Code for Institutional Research Collections in Herpetology and Ichthyology (Leviton et al., 1985).

SYSTEMATICS

Family Muraenidae

Subfamily Uropterygiinae Fowler, 1925

Genus *Uropterygius* Rüppell, 1838

Uropterygius Rüppell, 1838: 83 (type species *Uropterygius concolor* Rüppell, 1838, by monotypy).

Scutica Jordan and Evermann, 1896: 403 (type species *Gymnomuraena nectura* Jordan and Gilbert, 1882 = *Gymnomuraena macrocephalus* Bleeker, 1865, by monotypy). Described as a subgenus of *Uropterygius* Rüppell, 1838.

Description.—Body slender, moderately elongate, laterally compressed; head and trunk usually slightly shorter than tail. Median fins restricted to tail tip. Snout short, subconical and broad; jaws short, subequal and closing completely. Eye moderate, its center approximately above mid-jaw. Anterior nostril tubular, near tip of snout; posterior nostril a small round opening or in a short tube above anterior margin of eye. Gill opening small and slit-like, at or slightly below mid-flank. Head pores developed; typically three supraorbital, four infraorbital, six mandibular, and one or two branchial pores. Teeth mostly or entirely conical, slender, sharp and depressible, as well as wedge-shaped and slightly serrated on jaws in some species, often multiserial on jaws. Gill arches like those of all uropterygiins, hypobranchials 1–2 and ceratobranchials 1–4 ossified, lower pharyngeal tooth plates with a lateral groove. Gasbladder very reduced. Peritoneum pale. Coloration usually dark, either patterned or uniform.

Uropterygius xenodontus new species

Figures 1–2

Uropterygius inornatus, (nec Gosline) Randall et al., 1985: 33–34, fig. 8.

Diagnosis.—A moderate-length species of *Uropterygius* with vertical fins restricted to tail tip, anus at mid-body, one branchial pore, uniserial wedge-shaped teeth on jaws and uniserial conical teeth on vomer, a uniform gray-brown body coloration, and 154–157 total vertebrae.

Description.—(Counts and proportions of the holotype and three paratypes are given in Table 1.) Body laterally compressed throughout, subrectangular in cross section, its greatest depth 26–30 times in total length (TL). Body width 40–48 times in TL and 1.6–1.7 times in its depth. Tail about equal to head and trunk, the distance from snout to mid-anus 2.0–2.1 times in TL. Dorsal fin restricted to tail tip, arising above the 10th to 11th-from-last vertebra. Anal

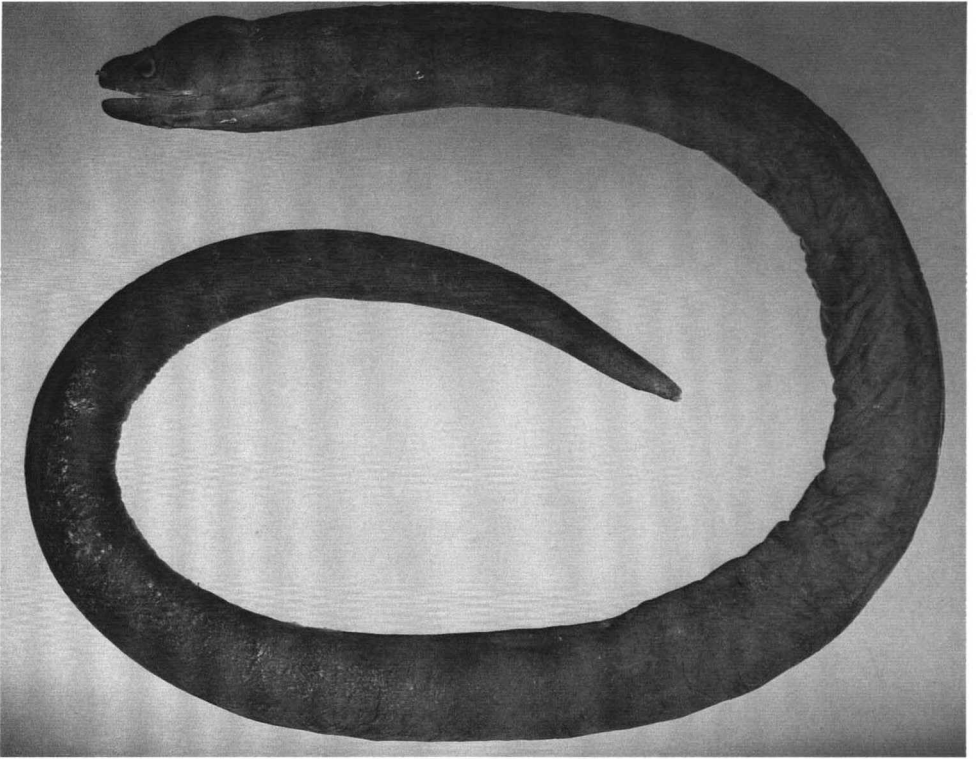


Figure 1. *Uropterygius xenodontus*, n. sp. Paratype. BPBM 8941, 530 mm TL, Johnston Island. Photograph by John E. Randall.

fin restricted to tail tip, arising below the 8th-from-last vertebra. Snout 4.8–5.1 times in head length (HL) and 2.0–2.05 times in upper jaw; upper jaw 2.1–2.5 times in HL. Eye 10–12.5 times in HL and 2.0–2.6 times in snout, its center slightly behind middle of jaw. Fleshy interorbital width 5.2–5.7 times in HL. Gill opening small, ovate and horizontal, lying about mid-flank, its length less than pupil of eye.

Anterior nostrils tubular, much shorter than eye, not extending beyond snout. Posterior nostrils within the interorbital space, above center of eye, lying within a very short tube.

Head pores distinct (Fig. 2a). Anterior nostril bases bordered laterally and ventrally by pores. Three supraorbital, four infraorbital, six mandibular, and a single (often difficult to discern) branchial pore. A faint series of minute, closely-spaced punctations exist posterior to branchial pore, ending in tail region; lateral line pores absent.

Jaws subequal, the mouth closing completely. Teeth in jaws (Fig. 2b–c) uniserial. Those on jaws somewhat wedge-shaped; those on vomer and in intermaxillary region conical. Upper jaw has 13–20 nearly subequal teeth flanking the intermaxillary patch and those of the vomer. Lower jaw has 12–20 nearly subequal (although smaller anteriorly and posteriorly) teeth in a row, with 3 larger, conical teeth at the anterior symphysis. Three nearly parallel rows of 3 conical teeth, increasing in size posteriorly, in intermaxillary region,

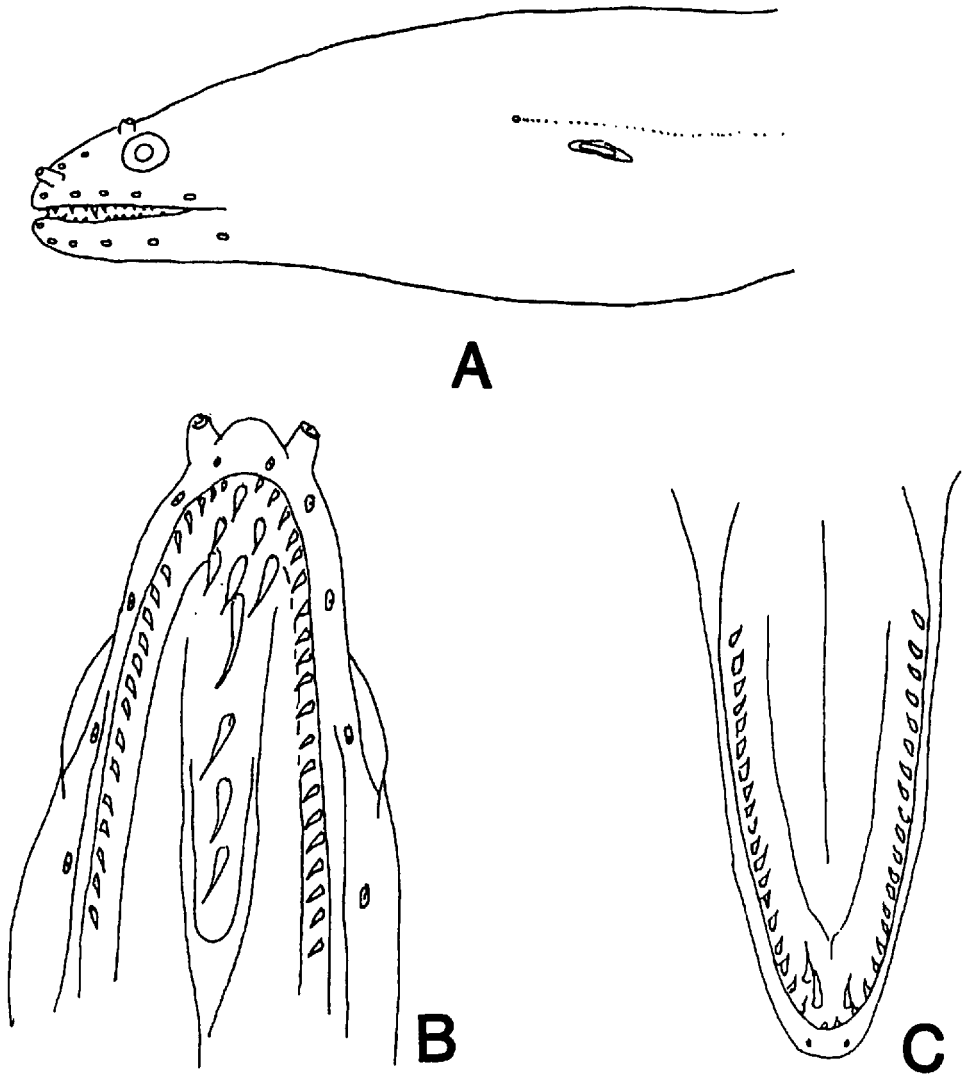


Figure 2. Head (A), upper jaw (B), and lower jaw (C) of *Uropterygius xenodontus*, n. sp. Holotype. BPBM 33558, female, 447 mm TL, Chesterfield Bank, Coral Sea.

followed by a large central tooth, and a gap and 3–4 large conical teeth on the vomer.

Total vertebrae 154–157, with approximately 66–69 before mid-anus, 143–146 before the origin of the dorsal fin, and 144–149 before the origin of the anal fin.

Coloration in Life.—Uniform brown to darker brown, with a darker brown faint mottling, overlain with a bluish cast (apparently due to mucus), based on color notes and photographs taken by John E. Randall, the collector of two of the specimens.

Coloration in Preservative.—Uniform reddish brown with a faintly darker mottling, overlain with a gray cast throughout body and tail, beginning behind head.

Table 1. Counts and proportions in thousandths, of the holotypes and paratypes of *Uropterygius xenodontus* and *U. golanii* (body = head + trunk, TL = total length, HL = head length)

	<i>U. xenodontus</i>			<i>U. golanii</i>		
	Holotype	Mean	Range	Holotype	Mean	Range
Total length	447 mm	—	304–530 mm	404 mm	—	291–453 mm
Head/TL	73	75	71–79	78	80	76–89
Body/TL	481	491	480–502	493	490	486–493
Tail/TL	519	509	498–520	507	510	507–514
Snout/HL	196	198	188–204	222	211	204–222
Upper jaw/HL	401	402	329–474	444	443	427–464
Eye/HL	86	86	79–100	92	87	80–92
Interorbital/HL	183	174	146–193	175	166	161–175
Depth/TL	33	36	33–38	41	42	40–48
Width/TL	21	23	21–25	28	27	23–31
Total vertebrae	155	155	154–157	147	146.8	145–148
Vertebrae before mid-anus	66	67.7	66–69	63	63.8	60–68
Vertebrae before dorsal fin	145	144.5	143–146	137	136.5	134–138
Vertebrae before anal fin	147	146.5	144–149	139	138.8	136–141

Etymology.—From the Greek *xenikos*, strange, and *odontos*, tooth, here treated as an adjective.

Distribution.—Known from the central and western Pacific Ocean, including the Coral Sea (NE Australia), American Samoa, the Marshall Islands, and Johnston Island.

Comparisons.—At first glance, the jaw dentition of the two new species appeared more like that of certain species of *Gymnothorax*, subfamily Muraeninae, than the typical *Uropterygius*-like dentition of the species of the subfamily Uropterygiinae.

The jaw teeth are decidedly wedge-shaped and slightly asymmetrical, but lack serrations along their edges. The senior author therefore removed and examined the gill arches of two specimens of *U. golanii*, the character which appears to best separate the members of the muraenid subfamilies (Nelson, 1966; Böhlke and McCosker, 1982; Böhlke et al., 1989). The gill arches of *U. golanii*, and presumably those of *U. xenodontus*, are clearly like those of the Uropterygiinae, possessing ossified hypobranchials in the first and second arch and the lower pharyngeal gill plates lie on the dorsal surface of the proximal end of the fourth ceratobranchial.

In his studies of muraenid dentition, Hatooka (1986) observed that sexual dimorphism occurs in the number of jaw teeth of *Gymnothorax richardsoni* and in the shape of jaw teeth of *Echidna nebulosa* and *E. polyzona*. We examined both the new species and several other species of *Uropterygius* but did not observe the presence of sexual dimorphism in the condition of the jaw teeth.

The *Gymnothorax*-like jaw teeth of the two new species appear to differ considerably from the slender and conical teeth of most species of *Uropterygius*. We therefore examined other species of *Uropterygius* and discovered that *U. inornatus* has jaw dentition similar to that of the new species but lacks vomerine teeth. Other species, such as *U. polystictus*, have wedge-shaped outer jaw teeth that are considerably smaller (and easily overlooked) than the inner row of longer and larger conical teeth that flank them. It is likely that the presence of wedge-shaped, dentition (which appear to provide a cutting func-

tion) and the presence of elongate conical dentition (which pierce, rather than cut) are a function of differences in prey type and capture. A more comprehensive review of all species of *Uropterygius* may provide a better understanding of the significance of this character. At this time, however, we find no reason to ascribe extrageneric significance to the presence of wedge-shaped jaw teeth within those species of *Uropterygius*.

The new species is most similar to *U. golanii*, described below, from which it differs significantly only in its vertebral numbers. Although we would be more comfortable if we had discovered additional differences in meristics or proportions, we find that the vertebral difference of these two taxa to be comparable to that displayed by closely related species of other muraenid (Böhlke et al., 1989; McCosker et al., 1984) and ophichthids (McCosker et al., 1989; McCosker and Rosenblatt, 1993).

The new species is also quite similar to *U. inornatus* Gosline (1958), described from Oahu, Hawaii. (The specimen identified as *U. inornatus* from Johnston Island [Randall et al., 1985: fig. 8] is a paratype of this new species [BPBM 8941].) We have subsequently identified specimens from Tonga, the Marshalls and Gilbert islands, and the Moluccas. *U. inornatus* differs in lacking vomerine teeth and in having fewer vertebrae. The holotype of *U. inornatus* has 133 and two paratypes have 129–131 total vertebrae; specimens from the western Pacific and Moluccas have 116–130 total vertebrae. Specimens of *U. inornatus* are quite small, from 48–189 mm in total length. We considered the possibility that the absence of vomerine dentition in *U. inornatus* might be a function of size, and to that end we examined the variation of vomerine dentition within a size range of other species of *Uropterygius*. We compared the teeth of a series of *U. macularius* (7 specimens, 98–235 mm TL), *U. concolor* (16 specimens, 98–275 mm TL), and *U. polystictus* (17 specimens, 58–231 mm TL). There was nothing to indicate a change in the location or number of vomerine teeth throughout the growth series examined in those species. The condition of the vomerine dentition of the new species is relatively invariable, which lends credence to our assumption that the absence of vomerine dentition in *U. inornatus* is not an artifact of the small size of the known specimens but is rather a significant difference between it and the condition of the new species.

The new species could also be mistaken for other uniform brown or gray species of *Uropterygius*, viz. *U. concolor* Rüppell (1838) and *U. genie* Randall and Golani (1995), however they differ trenchantly by possessing numerous, elongate conical jaw teeth.

Material Examined.—Holotype: BPBM 33558, 447 mm TL (a female with developing ova), Coral Sea, Chesterfield Bank (19°53.5' S, 158°28.2' E), SE side of lagoon, collected on 20 August 1988 by M. L. Kulbicki, J. E. Randall and P. J. Doherty using ichthyocide on a patch reef at 6–9 m depth. Paratypes: CAS 41183, 404 mm TL (male), American Samoa, off Tutuila Island, collected on 23 May 1978 by R. C. Wass. USNM 141683, 304 mm TL (female with enlarged eggs), Marshall Islands, Bikini Atoll, among coral heads at eastern end of lagoon, collected on 26 March 1946 by L. P. Schultz and V. E. Brock at 7 m depth. BPBM 8941, 530 mm TL, Johnston Island, outside the ocean reef northeast of the small boat channel, collected on 26 July 1968 by J. E. Randall, R. L. Bowers, and A. C. Banner using ichthyocide in 7 m depth.

Other Material Examined.—*Uropterygius inornatus*: Holotype: USNM 175007, 187 mm TL, Oahu, Waikiki, Hawaii; Paratypes: BPBM 14024 (formerly UH 2362), 2(117–189 mm), Waikiki, Hawaii. From: Marshall Islands, Bikini Atoll, USNM 141682, 2(101–142 mm); Gilbert Islands, Onotoa, USNM 167554, 185 mm; Tonga, Tongatapu, USNM 334834, 4(48–104 mm); Tonga, Eua, USNM 334831, 93 mm; Tonga, Uoleva Island, USNM 336441, 2(80–130 mm); Indonesia, Moluccas, Ambon, USNM 263097, 116 mm. *U. polystictus*: Holotype: AHF no. 16, 321 mm TL, Galapagos; and from the Gulf of California, Mexico: SIO 65–260, 142 mm; SIO 65–330, 10(122–

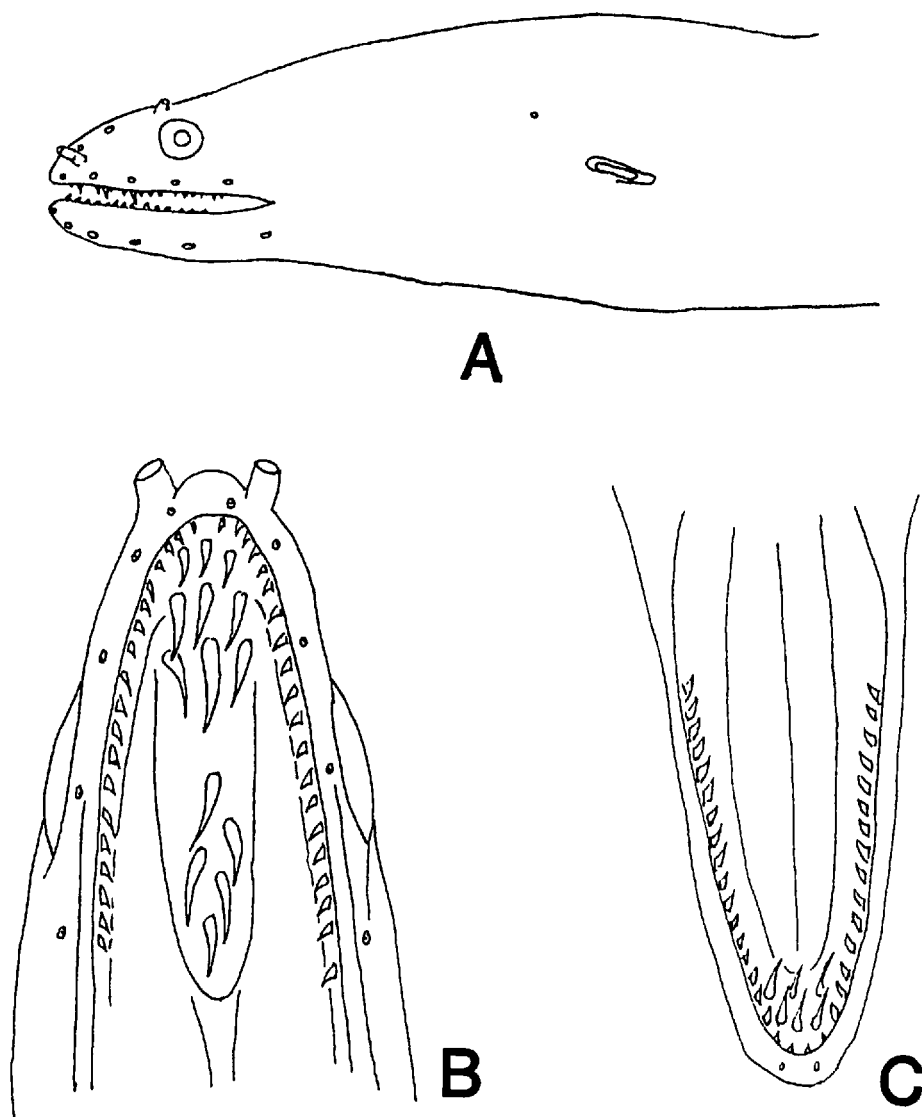


Figure 3. Head (A), upper jaw (B), and lower jaw (C) of *Uropterygius golanii*, n. sp. Holotype. USNM 312830, male, 404 mm TL, Red Sea, Egypt, Strait of Jubal.

230 mm); SIO 65-343, 2(90-140 mm); SIO 76-278, 259 mm; SIO 76-279, 58 mm; and SIO 76-283, 85 mm. *U. concolor*: Paralectotype: SMF 7422, 188 mm TL, Red Sea; and from various central and western Pacific locations: CAS 48103, 2(235-265 mm); CAS 63231, 7(151-232 mm); CAS 82316, 158 mm; CAS 82315, 275 mm; and CAS 82314, 3(240-270 mm). *U. macularius*: Neotype: ANSP 106286, 224 mm TL, Bahamas; and from the San Blas Archipelago, Panama: SIO 71-272, 3(161-235 mm); CAS 31218, 2(98-138 mm); CAS 31673, 223 mm.

***Uropterygius golanii*, new species**

Figure 3

Diagnosis.—A moderate-length species of *Uropterygius* with vertical fins restricted to tail tip, anus at mid-body, one branchial pore, uniserial wedge-

shaped teeth on jaws and uniserial conical teeth on vomer, a uniform gray-brown body coloration, and 145–148 total vertebrae.

Description.—(Counts and proportions of the holotype and three paratypes are given in Table 1.) Body laterally compressed throughout, subrectangular in cross section, its greatest depth 20–25 times in total length (TL). Body width 32–43 times in TL and 1.4–1.7 times in its depth. Tail about equal to head and trunk, the distance from the snout to mid-anus 2 times in TL. Dorsal fin restricted to tail tip, arising above the 10th to 11th-from-last vertebra. Anal fin restricted to tail tip, arising below the 9th to 11th-from-last vertebra. Snout 4.5–4.9 times in head length (HL) and 2.0–2.05 times in upper jaw, and upper jaw 2.0–2.3 times in HL. Eye 10.9–12.5 times in HL and 2.2–2.5 times in snout, its center slightly behind middle of jaw. Fleshy interorbital width 5.5–6.2 times in HL. Gill opening small, ovate and horizontal, lying about mid-flank, its length less than pupil of eye.

Anterior nostrils tubular, much shorter than eye, not extending beyond snout. Posterior nostrils within the interorbital space, above center of eye, lying within a very short tube.

Head pores distinct (Fig. 3a). Anterior nostril bases bordered laterally and ventrally by pores. Three supraorbital, four infraorbital, six mandibular, and a single branchial pore. Lateral line pores absent.

Jaws subequal, the mouth closing completely. Teeth in jaws (Fig. 3b–c) uniserial. Those on jaws somewhat wedge-shaped; those on vomer and in intermaxillary region conical. Upper jaw has 14–15 nearly subequal teeth flanking the intermaxillary patch and those of the vomer. Lower jaw has 14–20 nearly subequal (although smaller anteriorly and posteriorly) teeth in a row, with 3–6 larger, conical teeth at the anterior symphysis. Three nearly parallel rows of 3 conical teeth, increasing in size posteriorly, in intermaxillary region, followed by a gap and 3–5 large conical teeth on the vomer. The holotype has a single tooth alongside another on the vomer, giving it the appearance of an irregular biserial row. The other paratypes have only uniserial vomerine teeth.

Total vertebrae 145–148, with ca. 60–68 before mid-anus, 134–138 before the origin of the dorsal fin, and 136–141 before the origin of the anal fin.

Coloration in Preservative.—Uniform reddish brown, overlain with a gray cast throughout body and tail, beginning behind head.

Etymology.—Named in honor of Daniel Golani of the Hebrew University of Jerusalem, who first brought specimens to our attention.

Distribution.—Known only from the northern Red Sea.

Comparisons.—The new species is most similar to *Uropterygius xenodontus*, described above, from which it differs in having fewer vertebrae.

Material Examined.—Holotype: USNM 312830, 404 mm TL (male), Red Sea, Egypt, Strait of Jubal, southern end of Sinai Peninsula at Ras Muhammed. Collected on 26 Sept. 1969 by V. G. Springer et al., using ichthyocide at 0–10 m. Paratypes: HJ 5266, 2(426–453 mm TL, gill arches of the larger specimen stained and cleared), Red Sea, Israel, Eilat, near the jetty of the Eilat-Ashkelon petrol line, collected on 8 July 1969 using ichthyocide at 4–10 m. USNM 31281, 291 mm TL (gill arches removed and stained and cleared), Red Sea, Israel, northwest coast of Gulf of Aqaba, a bay between Marsa Mokrah and El Himeira. Collected on 15 July 1969 by V. G. Springer et al. using ichthyocides at 0–3 m.

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